

Insufficient creatinine monitoring in the setting of direct oral anticoagulant therapy for non-valvular atrial fibrillation.
 Authors: Martin M Gruca, MD, MSc, Yun Li, PhD; Xiaowen Kong, MS; Deborah DeCamillo RN, BSN; Eva Kline-Rogers, NP; Mona A Ali, PharmD; Scott Kaatz, DO, MSc; Musa Dahu, MD; James B Froehlich, MD, MPH; Geoffrey D Barnes, MD, MSc

Supplementary Table 1: Published recommendations for frequency of creatinine monitoring in the setting of direct anticoagulant therapy

Publication	Creatinine Monitoring Recommendations	
Conway et al, 2017 ^a	Every 6 months in patients with CrCl>60	Every 3-6 months in patients with CrCl≤60
Gladstone et al, 2015 ^b	Every 12 months in patients without renal impairment	Every 6-12 months, more frequently in patients with worsening renal function
American Heart Association ^c	At least every 12 months	No specific recommendation in patients with renal impairment
International Society of Nephrology ^d	Every 6-12 months in patients with eGFR≥60, depending on level of proteinuria	Every 4-12 months, for patients with eGFR<60, more often with evidence of proteinuria or declining renal function
European Heart Rhythm Association ^e	Every 12 months	In patients with CrCl≤60, divide creatinine clearance by 10 to determine the number of months between lab draws. Patients 75-80 years old or considered frail should be monitored at least every 6 months.

a. Conway SE, Hwang AY, Ponte CD, Gums JG. Laboratory and clinical monitoring of direct acting oral anticoagulants: what clinicians need to know. *Pharmacother J Hum Pharmacol Drug Ther.* 2017;37(2):236-248.

b. Gladstone DJ, Geerts WH, Douketis J, Ivers N, Healey JS, Leblanc K. How to monitor patients receiving direct oral anticoagulants for stroke prevention in atrial fibrillation: a practice tool endorsed by Thrombosis Canada, the Canadian Stroke Consortium, the Canadian Cardiovascular Pharmacists Network, and the Canadian Cardiovascular Society. *Ann Intern Med.* 2015;163(5):382-385.

c. January CT, Wann LS, Alpert JS, et al. 2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation: A report of the american college of cardiology/american heart association task force on practice guidelines and the heart rhythm society. *Circulation.* 2014;130(23):e199-267.

d. Levin A, Stevens PE, Bilous RW, et al. Kidney disease: Improving global outcomes (KDIGO) CKD work group. KDIGO 2012 clinical practice guideline for the evaluation and management of chronic kidney disease. *Kidney International Supplements.* 2013;3(1):1-150.

e. Heidbuchel H, Verhamme P, Alings M, et al. Updated european heart rhythm association practical guide on the use of non-vitamin K antagonist anticoagulants in patients with non-valvular atrial fibrillation. *EP Europace.* 2015;17(10):1467-1507

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Supplementary Table 2: Multivariable logistic regression modeling the probability of receiving insufficient renal function monitoring^{ab}

	Odds Ratio	95% Confidence Interval
Increasing Age, by year	1.00	(0.97, 1.03)
Baseline Kidney Function (CrCl \leq 50 vs. CrCl $>$ 50) ^{c*}	3.64	(1.81, 7.29)
Congestive Heart Failure [*]	0.39	(0.17, 0.91)
Hypertension	1.64	(0.70, 3.84)
Dabigatran vs. Apixaban	1.27	(0.15, 10.9)
Rivaroxaban vs. Apixaban	1.13	(0.62, 2.04)
Medicaid vs. Private Insurance	0.63	(0.31, 1.32)
Unknown Insurance vs. Private Insurance	2.30	(0.68, 7.81)

a. Parameters estimated via logistic regression.

b. Insufficient monitoring defined as <1 creatinine level/year for CrCl $>$ 50, <2 creatinine levels/year for CrCl \leq 50.

c. CrCl calculated by Cockcroft-Gault Equation.

* Statistically significant at alpha of 0.05.

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Supplementary Table 3: Multivariable logistic regression modeling the probability of receiving insufficient renal function monitoring, sensitivity analysis 1^{ab}

	Odds Ratio	95% Confidence Interval
Increasing Age, by year	1.01	(0.98, 1.04)
Baseline Kidney Function (CrCl \leq 60 vs. CrCl $>$ 60) ^{c*}	5.05	(2.84, 8.96)
Congestive Heart Failure*	0.49	(0.24, 0.98)
Hypertension	1.40	(0.69, 2.83)
Dabigatran vs. Apixaban	2.09	(0.39, 11.28)
Rivaroxaban vs. Apixaban	1.02	(0.58, 1.80)
Medicaid vs. Private Insurance	0.62	(0.31, 1.21)
Unknown Insurance vs. Private Insurance	2.02	(0.59, 6.84)

a. Parameters estimated via logistic regression.

b. Insufficient monitoring defined as <1 creatinine level/year for CrCl $>$ 60, <2 creatinine levels/year for CrCl $>$ 30-60, and <3 creatinine levels/year for CrCl 15-30.

c. CrCl calculated by Cockcroft-Gault Equation.

* Statistically significant at alpha of 0.05.

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Supplementary Table 4: Multivariable logistic regression modeling the probability of receiving insufficient renal function monitoring, sensitivity analysis 2^{ab}

	Odds Ratio	95% Confidence Interval
Increasing Age, by year	1.00	(0.97, 1.03)
Baseline Kidney Function (CrCl≤50 vs. CrCl>50) ^c	0.61	(0.22, 1.75)
Congestive Heart Failure	0.37	(0.13, 1.08)
Hypertension	1.71	(0.68, 4.68)
Dabigatran vs. Apixaban	1.27	(0.15, 11.0)
Rivaroxaban vs. Apixaban	1.09	(0.56, 2.10)
Medicaid vs. Private Insurance	0.60	(0.28, 1.27)
Unknown Insurance vs. Private Insurance	2.86	(0.85, 9.56)

a. Parameters estimated via logistic regression.

b. Insufficient monitoring defined as <1 creatinine level/year.

c. CrCl calculated by Cockcroft-Gault Equation.

* Statistically significant at alpha of 0.05.